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REFERENCE: U-5169

PROJECT: 45220

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5169	1	22

STRUCTURE
SUBSURFACE INVESTIGATION

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	PROFILE
5-9	CROSS SECTIONS
10-19	BORE LOGS, CORE REPORTS, AND CORE PHOTOGRAPHS
20	ROCK TEST RESULTS
21	SITE PHOTOGRAPHS

COUNTY GUILFORD
PROJECT DESCRIPTION I-74/US 311 & NC 68
(EASTCHESTER DRIVE) INTERCHANGE RAMP
REPLACEMENT
SITE DESCRIPTION WIDEN BRIDGE NO.1031 ON NC 68
(-Y-) OVER I-74/US 311 (-L-)

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

B. JOHNSON
R. TOOTHMAN
W. ALLEN

INVESTIGATED BY B. JOHNSON
DRAWN BY B. JOHNSON
CHECKED BY T. WELLS
SUBMITTED BY KLEINFELDER, INC.
DATE MAY 2017

Prepared in the Office of:



KLEINFELDER
Bright People. Right Solutions.
7343 WEST FRIENDLY AVENUE, SUITE B
GREENSBORO, NC 27409
NC FIRM LICENSE NO. F-132



DocuSigned by:
Thomas R. Wells 5/26/2017
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SIGNATURE DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																					
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																					
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

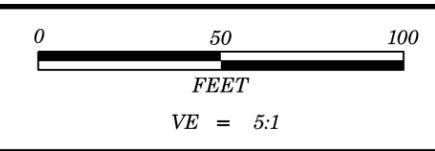
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

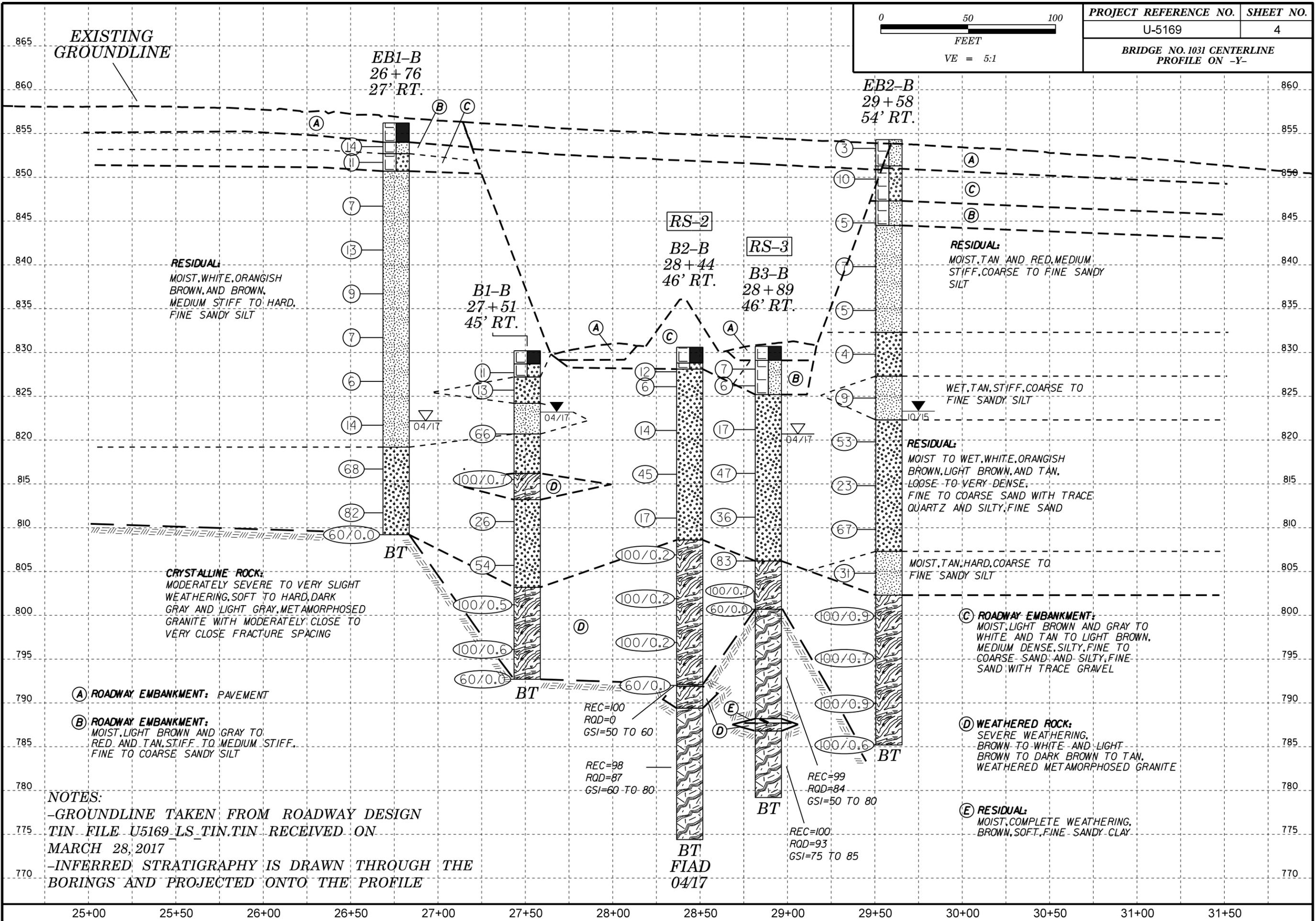
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

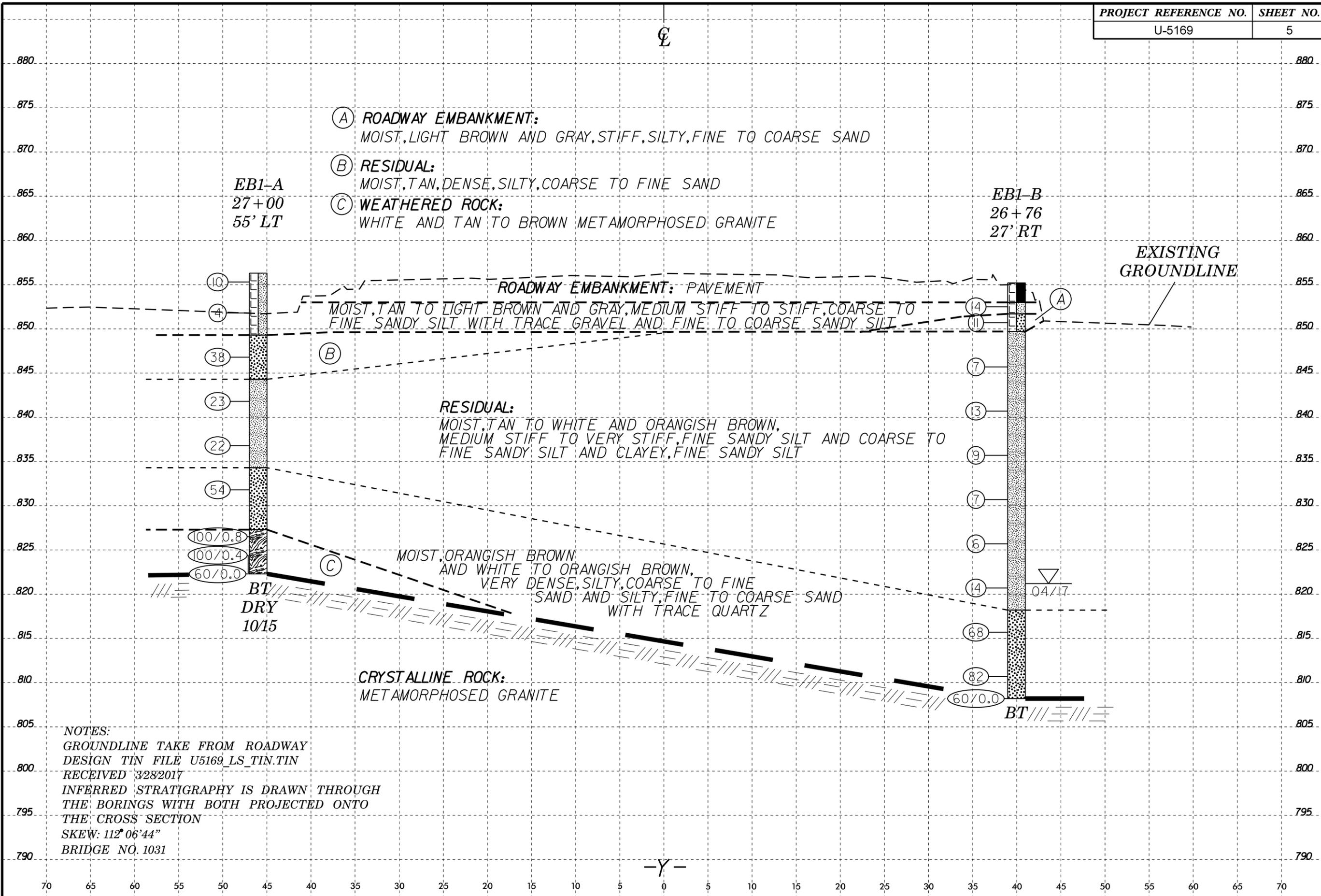
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)				
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.		VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE						
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities		90			N/A	N/A	A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		80					B. Sandstone with thin inter-layers of siltstone	60					
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets			70				C. Sandstone and siltstone in similar amounts		50				
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			60				D. Siltstone or silty shale with sandstone layers			40			
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				50			E. Weak siltstone or clayey shale with sandstone layers				30		
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes				40			F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					20	
				30			G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						10
				20			H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.						
				10									
		N/A	N/A										

→ Means deformation after tectonic disturbance



PROJECT REFERENCE NO.	SHEET NO.
U-5169	4
BRIDGE NO. 1031 CENTERLINE PROFILE ON -Y-	





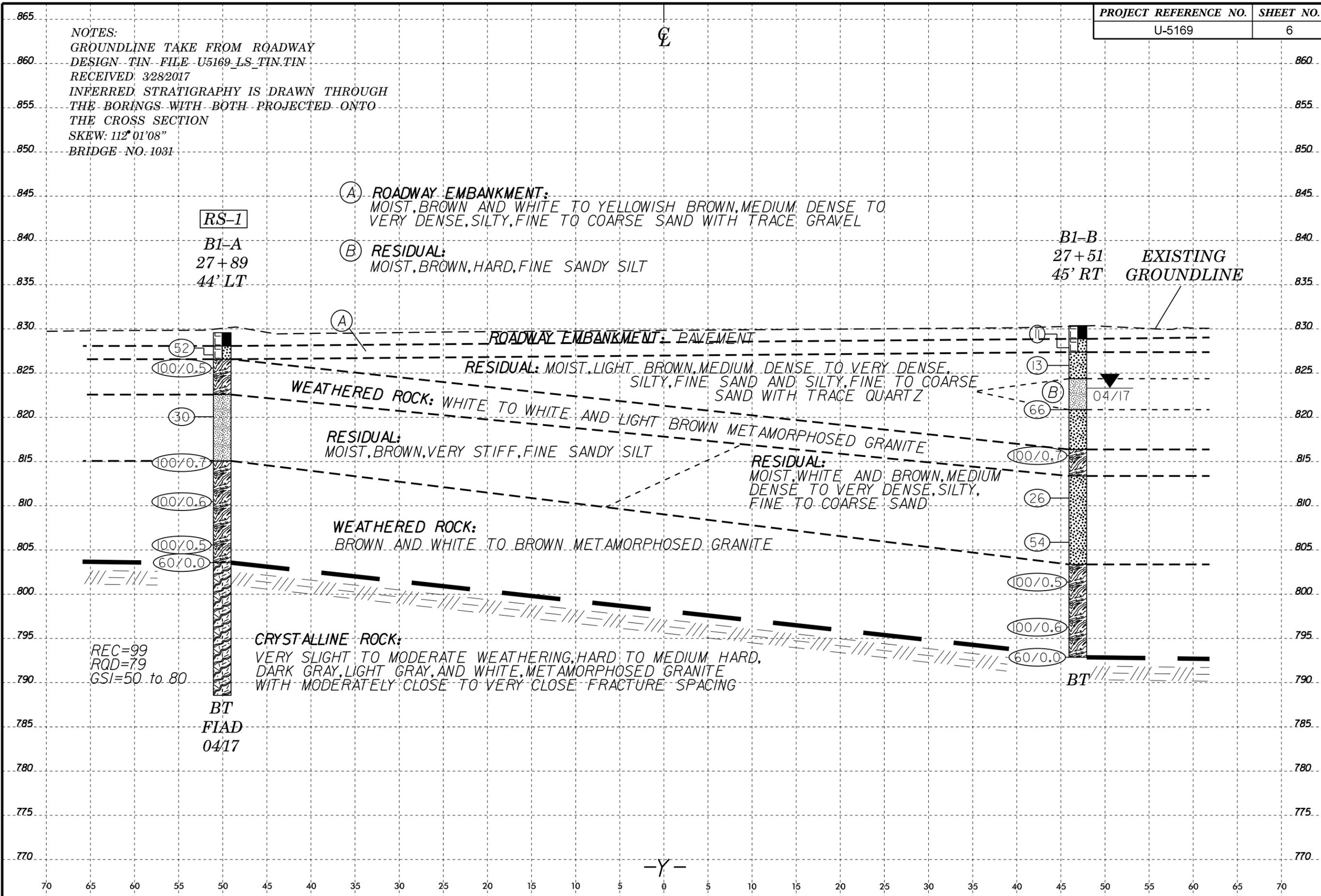
NOTES:
 GROUNDLINE TAKE FROM ROADWAY
 DESIGN TIN FILE U5169_LS_TIN.TIN
 RECEIVED 3/28/2017
 INFERRED STRATIGRAPHY IS DRAWN THROUGH
 THE BORINGS WITH BOTH PROJECTED ONTO
 THE CROSS SECTION
 SKEW: 112° 06' 44"
 BRIDGE NO. 1031

HORIZ. SCALE 0 10 20
 (FEET)

VE = 1:1

END BENT NO. 1 CROSS SECTION
 AT STA 27+13

NOTES:
 GROUNDLINE TAKE FROM ROADWAY
 DESIGN TIN FILE U5169_LS_TIN.TIN
 RECEIVED: 3/28/2017
 INFERRED STRATIGRAPHY IS DRAWN THROUGH
 THE BORINGS WITH BOTH PROJECTED ONTO
 THE CROSS SECTION
 SKEW: 112° 01' 08"
 BRIDGE NO. 1031



RS-1

B1-A
 27+89
 44' LT

B1-B
 27+51
 45' RT

**EXISTING
 GROUNDLINE**

(A) ROADWAY EMBANKMENT:
 MOIST, BROWN AND WHITE TO YELLOWISH BROWN, MEDIUM DENSE TO
 VERY DENSE, SILTY, FINE TO COARSE SAND WITH TRACE GRAVEL

(B) RESIDUAL:
 MOIST, BROWN, HARD, FINE SANDY SILT

ROADWAY EMBANKMENT: PAVEMENT

RESIDUAL: MOIST, LIGHT BROWN, MEDIUM DENSE TO VERY DENSE,
 SILTY, FINE SAND AND SILTY, FINE TO COARSE
 SAND WITH TRACE QUARTZ

WEATHERED ROCK: WHITE TO WHITE AND LIGHT BROWN METAMORPHOSED GRANITE

RESIDUAL:
 MOIST, BROWN, VERY STIFF, FINE SANDY SILT

RESIDUAL:
 MOIST, WHITE AND BROWN, MEDIUM
 DENSE TO VERY DENSE, SILTY,
 FINE TO COARSE SAND

WEATHERED ROCK:
 BROWN AND WHITE TO BROWN METAMORPHOSED GRANITE

CRYSTALLINE ROCK:
 VERY SLIGHT TO MODERATE WEATHERING, HARD TO MEDIUM HARD,
 DARK GRAY, LIGHT GRAY, AND WHITE, METAMORPHOSED GRANITE
 WITH MODERATELY CLOSE TO VERY CLOSE FRACTURE SPACING

REC=99
 RQD=79
 GSI=50 to 80

BT
FIAD
 04/17

BT

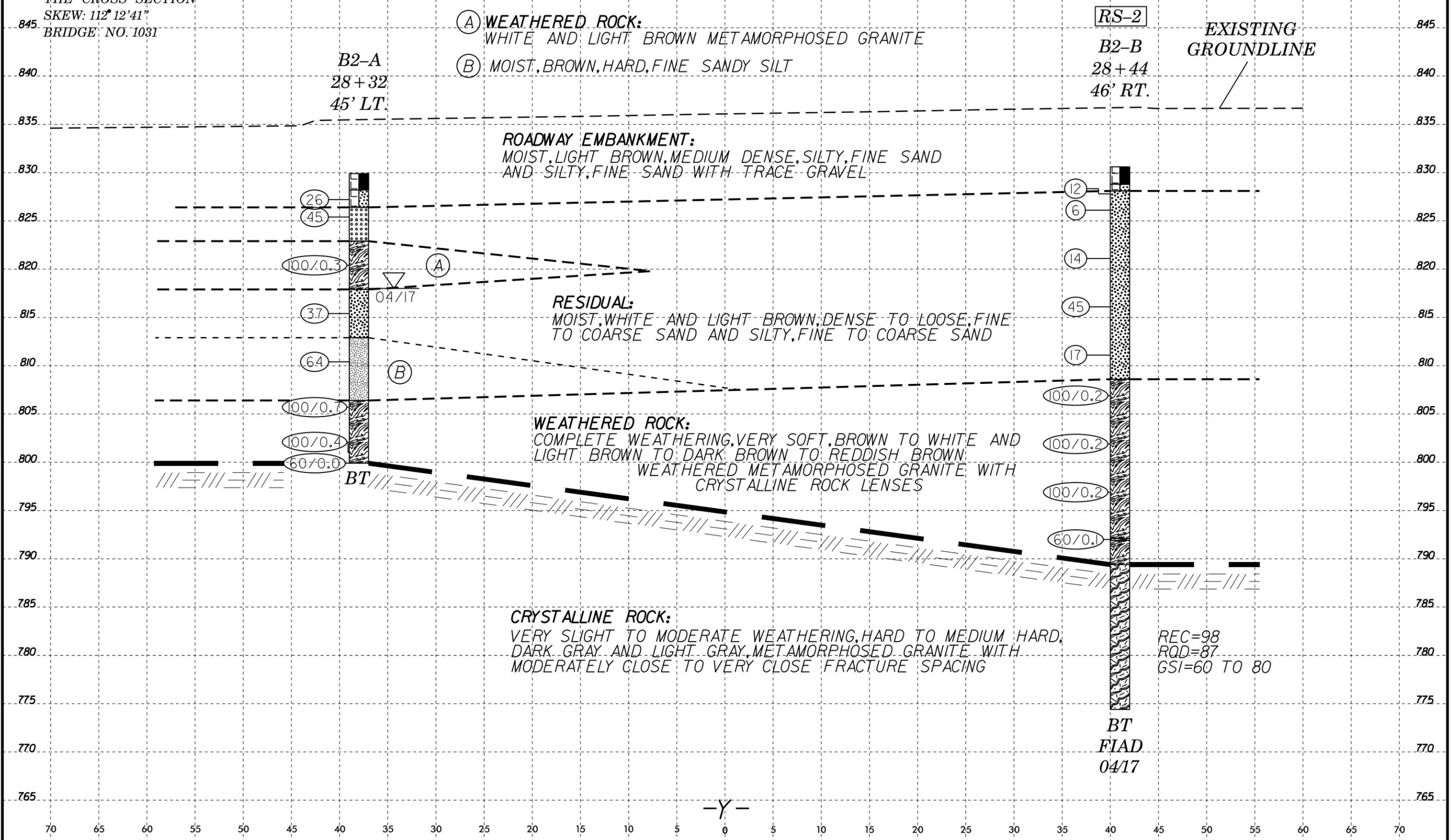
-Y-

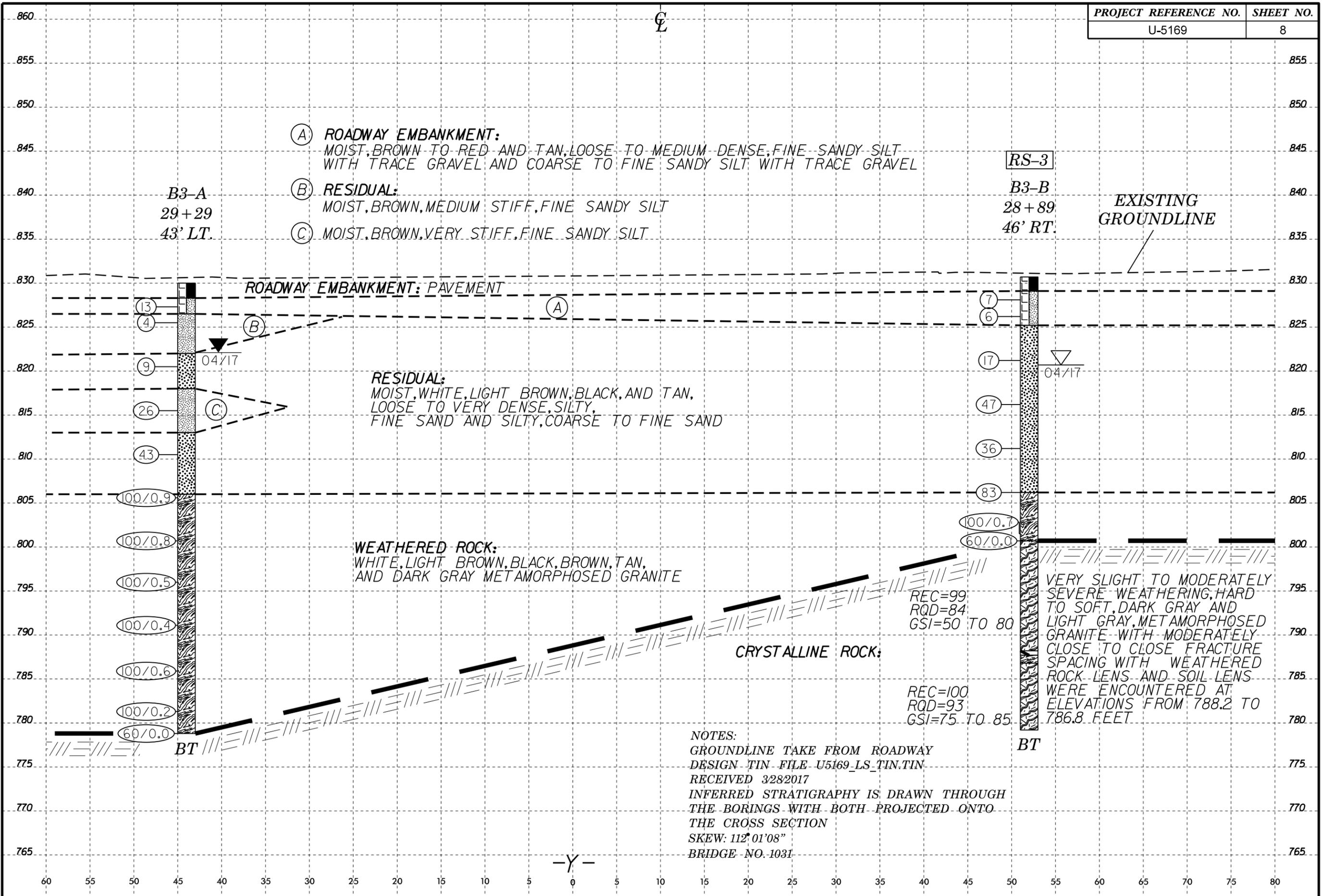
HORIZ. SCALE 0 10 20
 (FEET)

VE = 1:1

**BENT NO. 1 CROSS SECTION
 AT STA. 27+60**

NOTES:
 GROUNDLINE TAKE FROM ROADWAY
 DESIGN TIN FILE U5169_LS_TIN.TIN
 RECEIVED 3/28/2017
 INFERRED STRATIGRAPHY IS DRAWN THROUGH
 THE BORINGS WITH BOTH PROJECTED ONTO
 THE CROSS SECTION
 SKEW: 112° 12' 41"
 BRIDGE NO. 1031





- (A) **ROADWAY EMBANKMENT:**
MOIST, BROWN TO RED AND TAN, LOOSE TO MEDIUM DENSE, FINE SANDY SILT WITH TRACE GRAVEL AND COARSE TO FINE SANDY SILT WITH TRACE GRAVEL
- (B) **RESIDUAL:**
MOIST, BROWN, MEDIUM STIFF, FINE SANDY SILT
- (C) **RESIDUAL:**
MOIST, BROWN, VERY STIFF, FINE SANDY SILT

B3-A
29+29
43' LT.

RS-3
B3-B
28+89
46' RT.

EXISTING
GROUNDLINE

ROADWAY EMBANKMENT: PAVEMENT

RESIDUAL:
MOIST, WHITE, LIGHT BROWN, BLACK, AND TAN,
LOOSE TO VERY DENSE, SILTY,
FINE SAND AND SILTY, COARSE TO FINE SAND

WEATHERED ROCK:
WHITE, LIGHT BROWN, BLACK, BROWN, TAN,
AND DARK GRAY METAMORPHOSED GRANITE

CRYSTALLINE ROCK:

VERY SLIGHT TO MODERATELY
SEVERE WEATHERING, HARD
TO SOFT, DARK GRAY AND
LIGHT GRAY, METAMORPHOSED
GRANITE WITH MODERATELY
CLOSE TO CLOSE FRACTURE
SPACING WITH WEATHERED
ROCK LENS AND SOIL LENS
WERE ENCOUNTERED AT
ELEVATIONS FROM 788.2 TO
786.8 FEET

NOTES:
GROUNDLINE TAKE FROM ROADWAY
DESIGN TIN FILE U5169_LS_TIN.TIN
RECEIVED 3/28/2017
INFERRED STRATIGRAPHY IS DRAWN THROUGH
THE BORINGS WITH BOTH PROJECTED ONTO
THE CROSS SECTION
SKEW: 112° 01' 08"
BRIDGE NO. 1031

HORIZ. SCALE 0 10 20
(FEET)

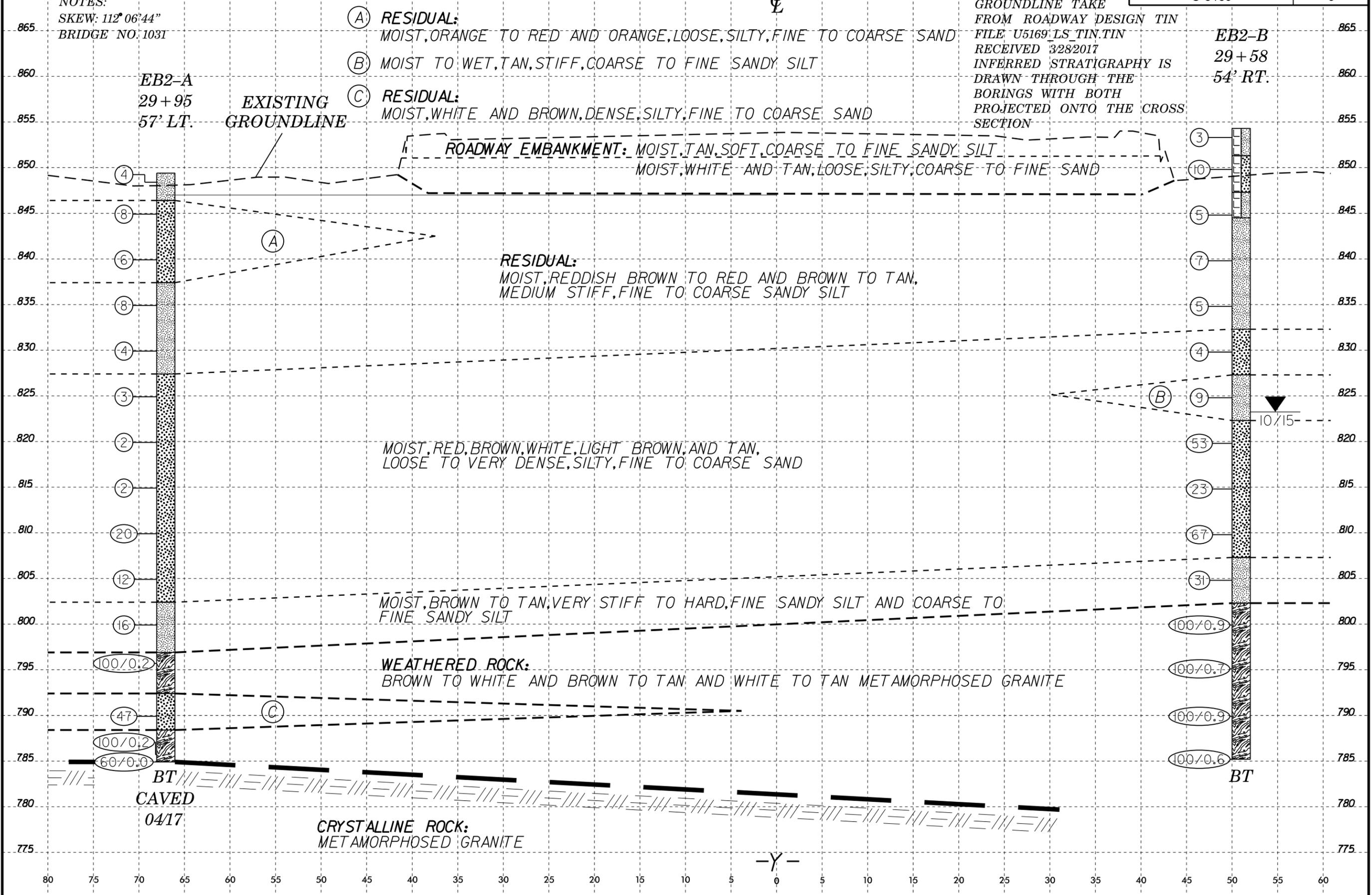
VE = 1:1

BENT NO. 3 CROSS SECTION
AT STA. 29+20

NOTES:
 SKEW: 112° 06' 44"
 BRIDGE NO: 1031

NOTES:
 GROUNDLINE TAKE
 FROM ROADWAY DESIGN TIN
 FILE U5169_LS_TIN.TIN
 RECEIVED 3/28/2017
 INFERRED STRATIGRAPHY IS
 DRAWN THROUGH THE
 BORINGS WITH BOTH
 PROJECTED ONTO THE CROSS
 SECTION

EB2-B
 29+58
 54' RT.



HORIZ. SCALE 0 10 20 (FEET)

VE = 1:1

END BENT NO. 2 CROSS SECTION AT STA. 29+60

GEOTECHNICAL BORING REPORT

BORE LOG

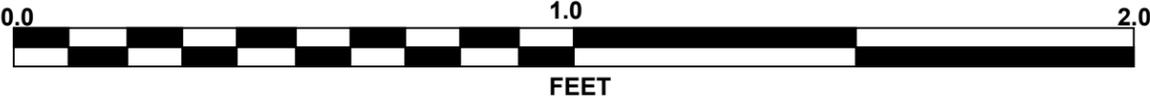
WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Goodnight, D.									
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 27+00		OFFSET 55 ft LT		ALIGNMENT -Y-									
COLLAR ELEV. 856.3 ft		TOTAL DEPTH 34.0 ft		NORTHING 820,983		EASTING 1,706,513									
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 88% 11/02/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER Cain, J.		START DATE 10/22/15		COMP. DATE 10/22/15		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
860															
855	856.3	0.0	3	4	6									856.3	GROUND SURFACE
															ROADWAY EMBANKMENT
															Tan, Coarse to Fine Sandy SILT with Trace Gravel
850	852.8	3.5	3	2	2									849.3	RESIDUAL
															Tan, Silty, Coarse to Fine SAND
845	847.8	8.5	11	17	21									844.3	RESIDUAL
															Tan, Fine Sandy SILT
840	842.8	13.5	6	10	13										
835	837.8	18.5	4	7	15									834.3	
															Tan, Silty, Coarse to Fine SAND
830	832.8	23.5	20	26	28										
825	827.8	28.5	20	60	40/0.3									827.3	WEATHERED ROCK
															White and Tan, METAMORPHOSED GRANITE
	822.8	33.5												822.3	
	822.3	34.0	100/0.4												Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 822.3 ft on CRYSTALLINE ROCK: METAMORPHOSED GRANITE

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Johnson, B.									
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 26+76		OFFSET 27 ft RT		ALIGNMENT -Y-									
COLLAR ELEV. 856.2 ft		TOTAL DEPTH 47.0 ft		NORTHING 820,923		EASTING 1,706,574									
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 89% 02/24/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER Toothman, R.		START DATE 04/10/17		COMP. DATE 04/10/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
860															
855	854.5	1.7	26	7	7									856.2	GROUND SURFACE
															ROADWAY EMBANKMENT
															Pavement (0.0 to 2.2)
850	852.7	3.5	3	5	6									854.0	
															Light Brown and Gray, Fine to Coarse Sandy SILT
845	847.7	8.5	2	3	4									850.7	
															Light Brown and Gray, Silty, Fine to Coarse SAND
840	842.7	13.5	4	5	8										RESIDUAL
															White and Orangish Brown to Orangish Brown, Fine Sandy SILT
835	837.7	18.5	3	4	5										
830	832.7	23.5	3	4	3										
825	827.7	28.5	1	1	5										
820	822.7	33.5	3	6	8										
815	817.7	38.5	25	41	27									819.2	
															Orangish Brown and White to Orangish Brown, Silty, Fine to Coarse SAND to Silty, Fine to Coarse SANDY with Trace Quartz
810	809.2	47.0	60/0.0											809.2	
															Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 809.2 ft on CRYSTALLINE ROCK: METAMORPHOSED GRANITE

NCDOT BORE DOUBLE U5169_GEO_BRDG.GPJ NC_DOT.GDT 5/17/17

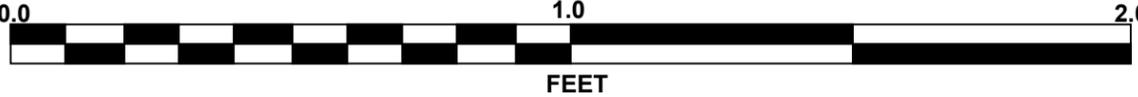
CORE PHOTOGRAPHS

B1-A
BOXES 1 and 2: 26.0 TO 41.0 FEET



CORE PHOTOGRAPHS

B2-B
BOXES 1 and 2: 38.5 TO 56.2 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Johnson, B.										
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)									
BORING NO. B3-A		STATION 29+29		OFFSET 43 ft LT		ALIGNMENT -Y-										
COLLAR ELEV. 830.0 ft		TOTAL DEPTH 51.2 ft		NORTHING 821,178		EASTING 1,706,633										
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 89% 02/24/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Toothman, R.		START DATE 04/06/17		COMP. DATE 04/06/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
830														830.0	GROUND SURFACE	0.0
	828.3	1.7	8	8	5									828.3	ROADWAY EMBANKMENT	1.7
	826.5	3.5	5	2	2									826.5	Pavement (0.0 - 1.7 feet)	
825														826.5	Brown, Fine Sandy SILT with Trace Gravel	3.5
															RESIDUAL	
															Brown, Fine Sandy SILT	
	821.5	8.5	2	4	5									822.0	White and Light Brown, Silty, Fine SAND	8.0
820																
	816.5	13.5	8	12	14									818.0	Brown, Fine Sandy SILT	12.0
815																
	811.5	18.5	10	15	28									813.0	Black and White, Silty, Fine SAND	17.0
810																
	806.5	23.5	30	70/0.4										806.0	WEATHERED ROCK	24.0
805															White and Light Brown to Black, White, and Brown to Dark Gray METAMORPHOSED GRANITE	
	801.5	28.5	44	56/0.3												
800																
	796.5	33.5	100/0.5													
795																
	791.5	38.5	100/0.4													
790																
	786.5	43.5	72	28/0.1												
785																
	781.5	48.5	100/0.2													
780																
	778.8	51.2	60/0.0											778.8	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 778.8 ft on CRYSTALLINE ROCK: METAMORPHOSED GRANITE	51.2

NCDOT BORE DOUBLE U5169_GEO_BRDG.GPJ NC_DOT.GDT 5/17/17

GEOTECHNICAL BORING REPORT

BORE LOG

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Johnson, B.									
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)								
BORING NO. B3-B		STATION 28+89		OFFSET 46 ft RT		ALIGNMENT -Y-									
COLLAR ELEV. 830.7 ft		TOTAL DEPTH 51.5 ft		NORTHING 821,101		EASTING 1,706,692									
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 89% 02/24/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Toothman, R.		START DATE 04/07/17		COMP. DATE 04/07/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
835															
830	829.1	1.6												830.7	0.0
	827.2	3.5	3	3	4									829.1	1.6
825			3	3	3									825.2	5.5
	822.2	8.5	6	7	10										
820															
	817.2	13.5	21	21	26										
815															
	812.2	18.5	10	13	23										
810															
	807.2	23.5	16	24	59										
805															
	802.2	28.5	22	78/0.2											
800	800.7	30.0	60/0.0											800.7	30.0
795															
790															
785															
780															

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Johnson, B.						
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)					
BORING NO. B3-B		STATION 28+89		OFFSET 46 ft RT		ALIGNMENT -Y-						
COLLAR ELEV. 830.7 ft		TOTAL DEPTH 51.5 ft		NORTHING 821,101		EASTING 1,706,692						
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 89% 02/24/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic							
DRILLER Toothman, R.		START DATE 04/07/17		COMP. DATE 04/07/17		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
800.7												
800	800.7	30.0	1.5	N=60/0.0	(1.4)	(1.2)		(12.4)	(10.5)		Continued from previous page	
	799.2	31.5	5.0	0:55/0.5	93%	80%	RS-3	99%	84%		CRYSTALLINE ROCK	30.0
				2:24	(5.0)	(4.5)					Very Slight to Moderately Severe Weathering, Hard to Soft, Dark Gray to Light Gray METAMORPHOSED GRANITE with Moderately Close to Close Fracture Spacing	
795	794.2	36.5	5.0	2:13	100%	90%					7 Fractures from 0 Degrees to 10 Degrees	
				2:40							2 Fractures from 10 Degrees to 20 Degrees	
				2:17							1 Fractures from 20 Degrees to 30 Degrees	
				2:32							2 Fractures from 30 Degrees to 40 Degrees	
790	789.2	41.5	5.0	2:18	(5.0)	(4.8)					4 Fractures from 40 Degrees to 50 Degrees	
				2:34	100%	96%					2 Fractures from 50 Degrees to 60 Degrees	
				2:16							2 Fractures from 70 Degrees to 80 Degrees	
				1:50								
				1:55								
785	784.2	46.5	5.0	4:08	(4.5)	(2.6)		(0.5)	(0.0)		RESIDUAL	42.5
				5:08	90%	52%		100%	0%		Complete Weathering, Brown, Fine Sandy CLAY	43.0
				4:41				(0.4)	(0.0)		WEATHERED ROCK	43.9
				2:58				44%	0%		Severe Weathering, Very Soft, White and Light Brown Weathered METAMORPHOSED GRANITE with Very Close Fracture Spacing	
				4:01				(7.6)	(7.1)		CRYSTALLINE ROCK	51.5
				2:24	(5.0)	(4.5)		100%	93%		Very Slight to Moderate Weathering, Light Gray and Dark Gray, Hard to Medium Hard, METAMORPHOSED GRANITE with Moderately Close to Close Fracture Spacing	
				2:55							Boring Terminated at Elevation 779.2 ft in CRYSTALLINE ROCK: METAMORPHOSED GRANITE	
				3:36								
				3:32								
				4:15								
780	779.2	51.5										

NCDOT BORE DOUBLE U5169_GEO_BRDG.GPJ NC_DOT_GDT 5/17/17

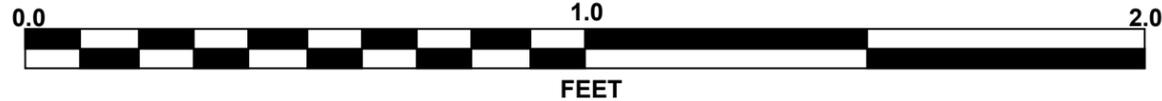
NCDOT BORE DOUBLE U5169_GEO_BRDG.GPJ NC_DOT_GDT 5/17/17

Boring B3-B was augured to refusal at 30.0 feet bgs and the presence of Crystalline Rock was confirmed with SPT refusal. Lithology Presented on Boring Log B3-B above 30.0 feet bgs is taken from the U-5169 Roadway Inventory Report (02/2016) - Boring LNB-2454

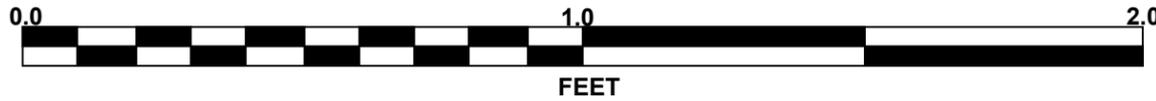
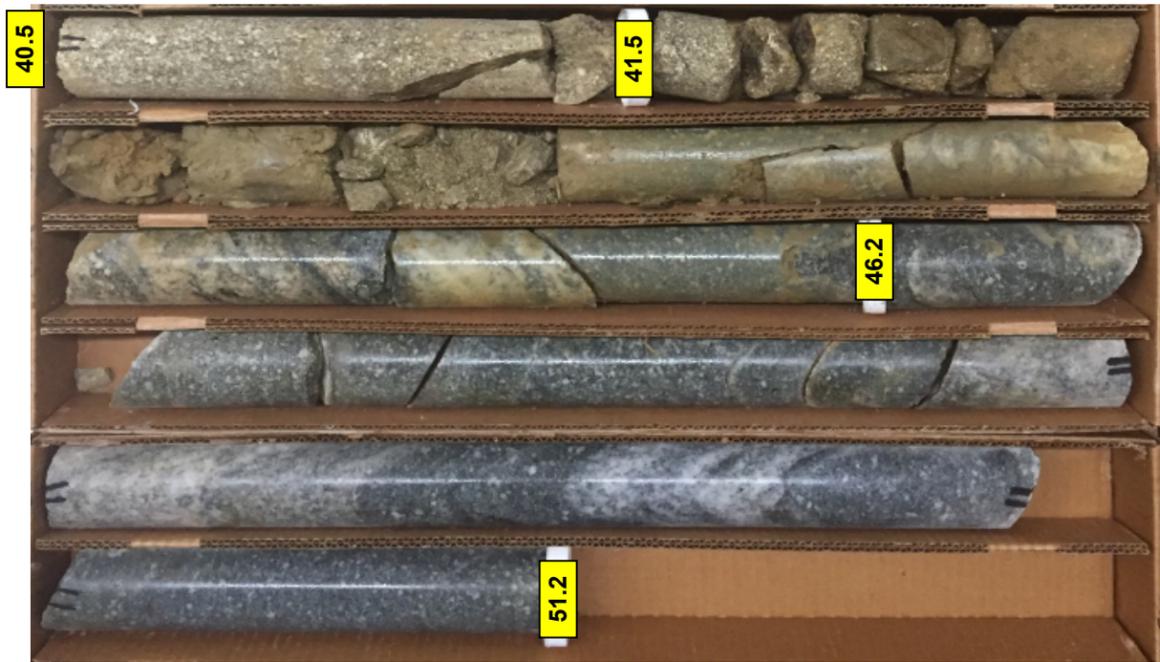
Boring B3-B was augured to refusal at 30.0 feet bgs and the presence of Crystalline Rock was confirmed with SPT refusal. Lithology Presented on Boring Log B3-B above 30.0 feet bgs is taken from the U-5169 Roadway Inventory Report (02/2016) - Boring LNB-2454

CORE PHOTOGRAPHS

B3-B
BOXES 1 and 2: 30.0 TO 40.5 FEET



B3-B
BOXES 2 and 3: 40.5 TO 51.2 FEET



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Johnson, B.										
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 29+95		OFFSET 57 ft LT		ALIGNMENT -Y-										
COLLAR ELEV. 848.4 ft		TOTAL DEPTH 64.5 ft		NORTHING 821,243		EASTING 1,706,652										
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 89% 02/24/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Toothman, R.		START DATE 04/10/17		COMP. DATE 04/10/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
850	848.4	0.0												848.4	GROUND SURFACE	0.0
			2	2	2								M	845.4	RESIDUAL Reddish Brown, Fine to Coarse Sandy SILT	3.0
845	844.9	3.5	1	4	4								M	845.4	Orange to Red and Orange, Silty, Fine to Coarse SAND	3.0
840	839.9	8.5	2	3	3								M	836.4	Reddish Brown to Red and Brown, Fine Sandy SILT	12.0
835	834.9	13.5	2	4	4								M	826.4	Red and Brown to White and Light Brown, Silty, Fine to Coarse SAND	22.0
830	829.9	18.5	2	2	2								M			
825	824.9	23.5	1	2	1								M			
820	819.9	28.5	1	1	1								M			
815	814.9	33.5	1	1	1								M			
810	809.9	38.5	3	6	14								M			
805	804.9	43.5	4	3	9								M			
800	799.9	48.5	4	7	9								M			
795	794.9	53.5	100/0.2										M	795.9	WEATHERED ROCK Brown METAMORPHOSED GRANITE	52.5
790	789.9	58.5	14	20	27								M	791.4	RESIDUAL White and Brown, Silty, Fine to Coarse SAND	57.0
785	784.9	63.5	100/0.2										M	787.4	WEATHERED ROCK White and Brown METAMORPHOSED GRANITE	61.0
	783.9	64.5	60/0.0											783.9	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 783.9 ft on CRYSTALLINE ROCK: METAMORPHOSED GRANITE	64.5

WBS 45220.1.2		TIP U-5169		COUNTY GUILFORD		GEOLOGIST Goodnight, D.										
SITE DESCRIPTION Widen Bridge No. 1031 on NC 68 (-Y-) over I-74/US 311 (-L-)							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 29+58		OFFSET 54 ft RT		ALIGNMENT -Y-										
COLLAR ELEV. 854.3 ft		TOTAL DEPTH 69.1 ft		NORTHING 821,158		EASTING 1,706,732										
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 11/02/2016			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic										
DRILLER Cain, J.		START DATE 10/26/15		COMP. DATE 10/26/15		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
855	854.3	0.0												854.3	GROUND SURFACE	0.0
			2	1	2								M	851.3	ROADWAY EMBANKMENT Tan, Coarse to Fine Sandy SILT	3.0
850	850.8	3.5	5	5	5								M	847.3	White and Tan, Silty, Coarse to Fine SAND	7.0
845	845.8	8.5	2	2	3								M	844.5	Red-Tan, Coarse to Fine Sandy SILT	9.8
840	840.8	13.5	3	3	4								M	832.3	RESIDUAL Tan-Red, Coarse to Fine Sandy SILT	22.0
835	835.8	18.5	2	2	3								M	827.3	Tan and White, Silty, Coarse to Fine SAND	27.0
830	830.8	23.5	2	2	2								M	822.3	Tan, Coarse to Fine Sandy SILT	32.0
825	825.8	28.5	3	4	5								M	807.3	Tan-White, Silty, Coarse to Fine SAND	47.0
820	820.8	33.5	10	18	35								M	802.3	Tan, Coarse to Fine Sandy SILT	52.0
815	815.8	38.5	20	11	12								M			
810	810.8	43.5	25	24	43								M			
805	805.8	48.5	11	13	18								M			
800	800.8	53.5	43	57/0.4									M	802.3	WEATHERED ROCK Tan and White, Metamorphosed Granite	52.0
795	795.8	58.5	42	58/0.2									M			
790	790.8	63.5	30	70/0.4									M			
	785.8	68.5	50	50/0.1									M	785.2	Boring Terminated at Elevation 785.2 ft in WEATHERED ROCK: METAMORPHOSED GRANITE	69.1

NCDOT BORE DOUBLE U5169_GEO_BRDG.GPJ NC_DOT_GDT_5/17/17

SITE PHOTOGRAPHS



View Looking South along -Y- from End Bent 2



View Looking East on West Side of Bridge along -L-